



BSI Standards Publication

Solid recovered fuels — Determination of self-heating

Part 1: Isothermal calorimetry

National foreword

This British Standard is the UK implementation of EN ISO 21911-1:2023. It is identical to ISO 21911-1:2022.

The UK participation in its preparation was entrusted to Technical Committee PTI/17, Solid biofuels.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 580 97149 5

ICS 75.160.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2023.

Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Solid recovered fuels - Determination of self-heating - Part 1: Isothermal calorimetry (ISO 21911-1:2022)

Combustibles solides de récupération - Détermination
de l'auto-échauffement - Partie 1: Détermination
calorimétrique isotherme (ISO 21911-1:2022)

Feste Sekundärbrennstoffe - Bestimmung der
Selbsterhitzung - Teil 1: Isotherme Kalorimetrie (ISO
21911-1:2022)

This European Standard was approved by CEN on 24 August 2023.

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European foreword

The text of ISO 21911-1:2022 has been prepared by Technical Committee ISO/TC 300 "Solid recovered materials, including solid recovered fuels" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 21911-1:2023 by Technical Committee CEN/TC 343 "Solid recovered materials, including solid recovered fuels" the secretariat of which is held by SFS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2024, and conflicting national standards shall be withdrawn at the latest by February 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 21911-1:2022 has been approved by CEN as EN ISO 21911-1:2023 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 300, *Solid recovered materials, including solid recovered fuels*.

A list of all parts in the ISO 21911 series can be found on the ISO website.

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Introduction

There is a continuous global growth in the trading and use of solid recovered fuels (SRFs). This has resulted in an increased probability of fires, which has consequences for the handling, transporting and storage of SRFs.

SRFs can generate heat spontaneously by exothermic biological, chemical and physical processes. The heat build-up can be significant in large storage volumes if the heat conduction in the material is low. In some conditions the heat generation can lead to pyrolysis and spontaneous ignition. The potential for self-heating varies considerably for different types and qualities of SRFs and it is important to be able to identify SRF fractions with high heat generation potential to avoid fires in stored materials.

The increasing number of incidents is a clear indicator that safety needs to be prioritized, first of all for human safety and environmental concerns but also because interruptions in energy supply will have significant consequences. SRF fires throughout the supply chain will also, in addition to safety and environmental issues and direct economic losses, have a negative impact on the confidence in the SRFs as a reliable energy source. They can also lead to difficulties in obtaining insurance coverage.

It is difficult for SRF producers, logistics providers, SRF users, equipment suppliers and manufacturers, consultants, authorities and insurance providers to determine reasonable safety measures and an appropriate level of protection due to a lack of standards and recommendations.

As part of the determination and the assessment of risks for SRFs, defined test methods and standards are established or need to be developed. However, ageing and degradation due to the handling and storage of SRFs in actual environments affects their characteristics, so safety margins should be established in relation to actual analysis results.

The test method described in this document, isothermal calorimetry, is a method where the heat flow generated from the test portion is measured directly. The operating temperature for an isothermal calorimeter is normally in the range of 5 °C to 90 °C (some calorimeters can reach even higher temperatures) and can therefore measure low-temperature reactions, such as those from bacteria and other microbes. However, isothermal calorimetry is used for monitoring the thermal activity or heat flow of chemical, physical and biological processes. The technique is most commonly used in the fields of pharmaceuticals, energetic materials and cement. Isothermal calorimetry has also been applied for the measurement of heat flow from the self-heating of solid biofuel pellets^{[6]–[10]}.

For investigating heat generation at high temperatures, other types of test methods, such as basket heating tests, are possibly more suitable.

Data on spontaneous heat generation determined using this document are only associated with the specific quality, composition and age of the sample material.

The information derived using this document is for use in quality control and in hazard and risk assessments.